FINAL STATEMENT OF REASONS

FOR

PROPOSED BUILDING STANDARDS

OF THE

OFFICE OF THE STATE FIRE MARSHAL

REGARDING THE ADOPTION BY REFERENCE OF THE

2006 EDITION OF THE INTERNATIONAL FIRE CODE (IFC)

WITH AMENDMENTS INTO THE 2007 CALIFORNIA FIRE CODE

CALIFORNIA CODE OF REGULATIONS TITLE 24, PART 9.

The Administrative Procedure Act requires that every agency shall maintain a file of each rulemaking that shall be deemed to be the record for that rulemaking proceeding. The rulemaking file shall include a final statement of reasons. The Final Statement of Reasons shall be available to the public upon request when rulemaking action is being undertaken.

Health and Safety Code Section 18930 is part of the Building Standards Law that includes a nine-point written analysis that is required to be submitted by the Office of the State Fire Marshal for approval by the California Building Standards Commission prior to the adoption of building standards submitted by the Office of the State Fire Marshal. Under subpart (d) the Commission must give great weight to the determinations and analysis of the Office of the State Fire Marshal for each of the nine-point criteria submitted. Any factual determination used in the nine-point analysis by the Office of the State Fire Marshal shall be considered conclusive by the Commission unless the Commission specifically finds and sets forth in its reasoning in writing that the factual determination is arbitrary and capricious or substantially unsupported by the evidence considered by the Office of the State Fire Marshal.

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INTRODUCTION TO FINAL STATEMENT OF REASONS

SFM Commitment

California's first partnership with the International Building and Fire Codes is almost complete. During this past year, the Office of the State Fire Marshal (OSFM) has been working tirelessly to bring you the best set of building and fire code proposals possible. Several key things are important to remember:

1. The OSFM is committed to this adoption and believes strongly in the value of the ICC code process and the overall quality of the I-Codes.

2. The OSFM has taken extraordinary measures to ensure that this package represents the best in fire and life safety considerations, stakeholder involvement and economic considerations.

3. Both Fire and Building Code professionals have worked in concert under consensus-based guidelines to develop this package which now enjoys wide support.

This document is intended to be an overview for the entire submittal package and provides both the bigger picture perspective as well as specific analysis. Other portions of the submittal package such as "Response to Comments" and the Nine-Point Criteria refer back to it at times. The five main sections of this "Introduction" are:

1. IBC History
2. SFM Philosophy
3. Reasons for Proposed Amendments
4. Reasonable Solutions and Impacts
5. Final Conclusion

The adoption of an entire new set of building and fire codes is a complex task. The OSFM, along with the other state agencies, the Building Standards Commission and its Committees, and stakeholders have worked together this past year to produce this package. This document will clearly demonstrate that the OSFM proposals are necessary, reasonable, and deserve your support.

1. IBC History and Philosophy

The International Building Code (IBC) was created in the late 1990's when the three regional 'legacy' codes were merged into a single model code. This extremely complex task took several years and the first edition of the IBC was published in 2000. Since that time, growing numbers of jurisdictions across the country have adopted it, modified it, and called it their own.

The concept of a single building code for the nation is grounded in the economic efficiency gained by unified design and building criteria. It is cheaper to create, maintain, design and build to and enforce a single set of building standards. While a worthy concept, it must be recognized that this is a goal and not an absolute. No responsible city or state adopts a model code without thoroughly analyzing their geographic, climactic, and topographic characteristics as well as their public expectation of acceptable risk, demographics, economic conditions, public safety infrastructure and loss history.

We have exercised due diligence in this analysis and the OSFM is submitting for your approval a set of amendments to the IBC that we believe adequately addresses California's:

1. Statutory Mandates for Fire and Panic Safety

2. Natural Hazards (Seismic, Flood, Fire, Wind)

3. Life Safety and Property Loss

4. Vulnerable Populations (Persons with Disabilities, Non-English Speaking, Aged/Youth, Special Needs)

5. Social Perceptions of Acceptable Risk

2. SFM Adoption Philosophy

At the outset of this code adoption project (September 2005), State Fire Marshal Ruben Grijalva outlined a detailed guidance document that served as a foundational cornerstone for the OSFM amendment process. The key concepts from that document are still in effect today and include:

> *"It is the intent of the OSFM to utilize a "holistic" approach in evaluating the IBC vs. UBC and IFC vs. UFC in terms of the level of protection provided by these model codes. This approach would offer that both codes, while providing a minimum level of fire/life safety in distinctly different manners, when viewed "holistically" could be seen as substantially equivalent. One code's reliance on the performance of fire-extinguishing systems and more performance-based approach, as opposed to prescribed built-in fire-resistive features and intentionally redundant fire protection provisions may make side-by-side comparisons difficult for even the most technically proficient professionals based on differing strategies of fire and life safety protections.*
>
> *This approach requires that the comparison and subsequent amendment of the IBC to incorporate UBC or CBC provisions be done in a deliberate and thoughtful manner. Another result of this approach could be fewer State amendments, as the decision of which existing amendments to carry over could be made on a case-by-case basis. It also emphasizes a need to either participate in, or, at the very least, closely monitor development of the model code in order to assure the future safety of California.*
>
> *Stakeholder participation and input will be requested throughout the entire process. The development and review process will include several levels of review. A core workgroup will include representatives from state agencies with statutory authority, California Building Officials Association and California Fire Service. The intent is that the first draft will be developed by those without a financial interest in the outcome of the code. Subsequent review(s) will incorporate design professionals and industry representatives."*

In addition, SFM Grijalva also directed that each and every amendment be reasonable, effective, and "make a difference".

The entire OSFM package development has been an extremely open process from November 2005 to today. We organized a Core Committee of Fire and Building Officials, and State Agency representatives that served as the final voting review committee. Each occupancy classification was assigned to a Work Group with designated leaders and open membership to AHJ's, industry or interested parties. (See Appendix A – Core and Work Group Leaders)

All meeting locations, agendas and minutes were published on the SFM website where they remain today at *http://osfm.fire.ca.gov/CodeAdoptionProcess.html*. Stakeholder Mailing Lists were constructed and three stakeholder meetings were conducted around California in January, February and March, 2006. Agendas, minutes, and recorded comments were also provided on the website. Finally, while the predominant number of amendment proposals came from the work groups, any single individual could submit a proposal which was reviewed by the Core Committee.

All monographs and Express Terms were published on the web page as they developed and the overall approach from the OSFM was to engage continuously with affected stakeholders and seek mutually acceptable compromises. From the first drafts to today's submittal, over 90% of items at issue have been resolved. All in all, the process duplicated almost identically that used by the ICC and was open, communicated, and documented for public access. (See Appendix B – Schedule of Key Events)

Concept of Acceptable Risk

Inherent in all discussion of public safety is the concept of acceptable risk. The *ICC Performance Code for Buildings and Facilities (2006)* is a comprehensive guidance document that details a structured approach to risk analysis relative to building safety and has been used by the OSFM in constructing a rational approach to level of risk based on risk and hazard factors, and level of community importance of the building.

Some of the key considerations include:

302.4.1 Nature of the hazard. The nature of the hazard, whether it is likely to originate internal or external to the building or facility, and how it may impact the occupants, the building or facility, and the contents.

302.4.2 Number of occupants. The number of persons normally occupying, visiting, employed in, or otherwise using the building, facility, or portion of the building or facility.

302.4.3 Length of occupancy. The length of time the building or facility is normally occupied by people.

302.4.4 Sleeping characteristics. Whether people normally sleep in the building.

302.4.5 Familiarity. Whether the building or facility occupants and other users are expected to be familiar with the building or facility layout and means of egress.

302.4.6 Vulnerability. Whether a significant percentage of the building or facility occupants are, or are expected to be, members of vulnerable population groups such as infants, young children, elderly persons, persons with physical disabilities, persons with mental disabilities, or persons with other conditions or impairments that could affect their ability to make decisions, egress without the physical assistance of others or tolerate adverse conditions.

302.4.7 Relationships. Whether a significant percentage of building or facility occupants and other users have family or dependent relationships.

Along with the above risk factors, the social and behavioral factors of the occupants must also be considered when determining acceptable risk. The *ICC Performance Code for Buildings and Facilities (2006)* defines these values for each occupancy type.

Following are examples of the **Assembly** and **R-2 (Multi-Tenant Residential)** Occupancy Risk Factors.

> **A103.1.1 Assembly.** A building, structure or portion of a building or structure in which persons gather for purposes such as civic, social or religious functions, recreation, food and drink consumption, or awaiting transportation. Unless otherwise modified under a specific sub-use classification, occupants, visitors and employees shall be assumed to be awake, alert, predominantly able to exit without the assistance of others, and unfamiliar with the building or structure. Vulnerable populations of many types may be expected to be present; however, the buildings are normally occupied for only short periods of time. It shall be assumed that:
>
> 1. Risks of injury and health assumed by occupants and visitors during their use of the building or structure are predominantly involuntary.
> 2. Public expectations regarding the protection afforded those occupying, visiting or working in an assembly, building, structure or portion thereof are high.
>
> **A103.1.8.2 R-2, Multi-tenant residential.** A residential occupancy where the occupants are primarily permanent in nature and that contains more than two dwelling units. It shall be assumed that:
>
> 1. Occupants and visitors are not awake, alert, or able to exit without the assistance of others.
> 2. Occupants and visitors are familiar with the building or structure.
> 3. Risk of injury and risk to health assumed by occupants and visitors during their use of the building or structure are predominantly voluntary.
> 4. Public expectations regarding the protection afforded those occupying, visiting, or working in the R-2 residential building, structure, or portion thereof are neither unusually high nor unusually low.

These risk factors form a foundation for analyzing the building and its occupancy, then assigning it a Performance Category I-IV. Examples are as follows:

Category I Buildings -	Low risk, Agricultural, Storage, or Temporary Facilities.
Category II Buildings -	All buildings except I, III, or IV buildings
Category III Buildings-	Buildings that represent a substantial hazard to human life such as assembly with more than 300 people, educational, institutional, jails, moderate hazard class, and non-surgical or emergency health care facilities.
Category IV Buildings-	Essential Services buildings such as police and fire stations, communication centers, hospitals, fire suppression water treatment facilities, high hazard class occupancies, and any ancillary facility supporting fire suppression infrastructure.

Our amendment package appropriately targets the Category III and IV occupancies for a higher level layered fire protection based upon these ICC recommendations as applied to our seismic conditions in California.

Amending the Model Code

The OSFM has received opposition comments and criticism for amending the model code and the question of need has been raised. This document, along with the 9-pt Criteria and supporting submittals should be sufficient to answer the question of need.

First, it is necessary to orient to the overall set of amendments. While large in total number, once you begin to break them down, you can quickly set apart the ones that are substantial vs. the ones that are small in impact. Half are driven by direct statutory requirements incumbent upon the OSFM, and many others are attributed to leading code development issues such as Wildland-Urban Interface Building Standards or Motion Picture provisions.

Focus can be narrowed to the most significant and/or controversial amendments. These are primarily found in Chapter 5 and have centered on the General Height and Area provisions. In the following list, the total number of amendments is categorized into their relative area of impact and the amendments receiving the most attention are categorized as "Other" at the bottom of the list.

Most important is our approach to these amendments – they are small in number, precise in scope, and limited to those high-risk occupancies that the OSFM specifically regulates due to their potential for life loss. Their overall impact on the state of California or any particular industry or stakeholder is negligible to non-existent.

Finally, the OSFM Amendment Package has the widespread support of California Building and Fire Officials and many industry representatives. We believe that the comments of opposition to our package largely stem from misunderstandings about the scope of our proposals or concern about specific industry market share.

Number of Amendments	Description (Chapter/Item)
149	International to California
45	Chapter 2 – Definitions
38	Chapter 3 – Definitions
73	Care Facilities (I-1, I-4, R-3.1, R-4) (Statutorily Driven)
14	Large Family Daycare Homes (Statutorily Driven)
18	High-Rise (Statutorily Driven)
45	Group "L" Occupancies (The existing H-8 Occupancy)
34	Group "C" Occupancies (Camps) (Statutorily Driven)
28	Wine Caves (Statutorily Driven)
78	Fixed Guideways Transit Systems (FGTS) (Statutorily Driven)

3	Motion Picture & Television Production Studios (Statutorily Driven)
34	Explosives – (Title-19, CCR) (Statutorily Driven)
13	Combustion Engines/Electric Vehicle
14	Group “E” Occupancies (Statutorily Driven)
31	SFM Elevator Requirements
33	Existing R-1/R-2 (Statutorily Driven)
6	Existing R-1 High-Rise (Statutorily Driven)
32	Existing High-Rise (built prior 1975) (Statutorily Driven)
3	Existing Dwellings (Statutorily Driven)
6	Public Libraries (Statutorily Driven)
43	Group I-2, I-2.1 Occupancies (Statutorily Driven)
41	Group I-3 Occupancies (Statutorily Driven)
47	Chapter 7A – Exterior Wildfire Exposure (Statutorily Driven)
117	Chapter 35 – Referenced Standards
125	Correlation between Fire Code and Building Code - Chapter 9 (Amendments duplicated from the Fire Code to maintain consistency with IBC/IFC Model Code Format)
73	Other Amendments Chapter 10/Means of Egress [29] Chapter 5 [12] Height and Area [3] High-Rise Smoke Control [10] Corridors – 1-Hr/Smoke/Openings [15]

1,143 Amendments (588 Statutorily Driven)

While much has been made about the OSFM package containing 1,143 amendments, the vast majority are statutorily mandated or necessary clarifications specific to California. Only 73 amendments are classified as "substantively new" amendments to the 2006 International Codes and of those, only a small percentage (related to height and area provisions) have received significant negative comment.

3. Reasons for Proposed Amendments

As the legacy codes were merged, there was discussion about how to handle the widely varying height and area provisions found in each of the three codes. It was sufficiently complex that the drafting committee chose to use an existing formula that had been in discussion for several years. Life and property loss data was determined to be of such poor quality and relevancy that a data-based approach to height and area was impossible to construct.

A decision was made to simply use the base formula, then modify it so that no building would be considered non-conforming and that no region of the country would find the code more limiting than the one they were used to. This resulted in the Uniform/ICBO users generally finding that the IBC buildings are significantly larger than those they are used to.

A widely held perspective is that the buildings now being constructed under the IBC are formed of construction types, heights and areas that are larger and differently configured than any previous code allowed. This forms the foundation of the controversy around the "Height and Area" discussion as well as whether the IBC has an adequate level of balanced and/or layered fire protection.

Since the first IBC publication in 2000, this controversy has grown in volume and an increasing number of code proposals have been proposed with each cycle. With California's entry into the I-Codes adoption process, the issue has taken on greater significance since we represent such a major stakeholder.

The OSFM is committed to pursuing this issue to an acceptable level of conclusion and supporting the IBC fully. Meanwhile, we are making recommendations for reducing some area increases for the high-risk assembly, educational, institutional, residential, high-rise and hazardous occupancies.

The three amendments in Chapter 5 (Sections 504.2, 506.3, and 506.4) comprise the bulk of the Height and Area amendments and the OSFM will demonstrate to the Building Standards Commission that we believe these three amendments to be reasonable, limited in scope and effect, applicable equally to all building materials industries, and affecting only a few percent of the buildings actually built in California. In short, they represent a small to moderate effect with no negative economic impact from today's construction and building economy.

The bulk of reasoning behind our proposal for amending the model code is as follows:

1. California Demographics: The purpose of the OSFM is to protect people. We must consider who those people are and what their specific needs are in order to adequately protect them. The state population projections show an increasing percentage of residents with special needs such as age concerns, disabilities, and non-English speaking concerns.

   Some basic facts about California's unique social conditions should be stated. These are (US Census 2000):

- Age
  - Total state population in 2000 was 34 million
  - Total state population projected for 2030 is 46 million
  - 42% of population will be under age 17 or over age 65 in 2025

- Non-English Speaking
  - 40% speak another language at home, with 3.3 million speaking little to no English

- Disabled
  - 18% of the total population has some type of disability
  - 11.5% are Severely Disabled
  - These statistics are expected to grow as both supportive technology and age segments grow.

2. Natural Hazards - California is a significant natural hazard state. The IBC does not adequately address our regional seismic, wind, and wildfire frequency of occurrence. This is not a criticism, just a reflection that this is our problem, not the nations and we must ensure the code reflects our unique conditions.

3. Sprinkler Reliability – Two issues cause the OSFM concern in regards to placing the same reliance on sprinklers that the model code does. First is the national estimate of an overall reliability rating of 89%. This means that one fire in ten will not be effectively controlled by the primary method of protection. Second is that seismic events both spark ignitions and compromise sprinkler mechanical and water supply systems, all while overwhelming the emergency response system with rescue demands.

4. Fire Department Operations – The IBC states as a goal the consideration of firefighter safety along with the occupants and the need to design buildings to facilitate fire rescue and suppression demands. Yet no firefighter sits on the IBC Development Committee and there is insufficient understanding of what firefighters face when they are inside a building performing rescue and suppression. The OSFM worked directly with firefighters in analyzing the impacts of larger buildings on fire resources, tactics, and safety. We also ran through a response scenario for the R-2 occupancy. Their comments are summarized as:

   > "Time is the enemy. Bigger buildings without compartmentalization require more firefighter's on-scene, more potential for getting lost while interior, more need for air support."
   >
   > "Smoke is a significant problem, even when there are sprinklers there's a lot of smoke. In fact, sprinklers drive the smoke lower in the building and makes rescue more complicated. Smoke inhalation and disorientation are a big problem and firefighters must combat this even with sprinklers".
   >
   > "We use area separation walls for tactical control points, without them we will have to take more defensive tactics and may not go inside if the fire is well-seated".

   Overall, the operational input was that sprinklers are great but that they aren't always effective. When that happens, the fires we may be facing with the IBC heights and areas may be more difficult to extinguish than those we are currently staffed and trained to fight. Even when sprinklers do work, there is interior rescue, evacuation, and firefighting still to do.

Sprinkler Reliability

Sprinklers are a highly effective tool for controlling fires. They are one of the primary reasons that fire death and losses in America have declined over the past three decades.

The IBC acknowledges this success and relies on it heavily as it formulates a layered fire protection strategy. A total of 493 sprinkler trade-offs are allowed to all facets of building requirement (as compared to 225 in the UBC, 1997) from the controversial heights and areas allowances to smoke control to reduced exit widths. The net effect of this has been to encourage a wider, voluntary usage of sprinklers by builders since their use is cost-neutral or positive due to the trade-offs.

Yet a couple of troubling facts question whether this is an appropriately scaled approach. First is sprinkler reliability. Reliability is broken into two categories:

> Operational Reliability is the probability that a system or component will operate as intended when needed.
>
> Performance Reliability is the measure of the adequacy of a system once it has operated to control a fire.

Sprinklers are usually designed to control a fire rather than extinguish it. This means that when a fire starts, heat activates the sprinkler head, water flows and the fire is kept to a small size. The fire continues to burn although not spread rapidly. When firefighters arrive, the fire is still producing smoke and gases, evacuation and/or rescue is still required, and fire suppression is still required. The value of sprinklers is that if all works correctly, these are manageable events rather than rapidly spreading, uncontrolled events.

Several attempts at quantifying sprinkler reliability have been attempted and the most recent professional, published analysis supports a reliability average value of 89%. (Reliability of Automatic Sprinkler Systems, William E. Koffel, P.E., September 2005) This number represents a middle ground of the values being debated within the fire protection design system, and the OSFM feels it is a fair and supportable value. (See Appendix C – Reliability of Automatic Sprinkler Systems)

This 89% value means that roughly one fire in ten in a sprinklered building will escape the control of the designed, primary fire suppression system. When this occurs, the remaining back-up systems of compartmentalized area and firefighters then become the primary mechanisms of control. Recent anecdotal examples of this include: (Round Table/White Paper Presentation – Society for Fire Protection Engineers Symposium 2006, “Is the International Building Code Meeting Its Intent of Protecting Firefighters?”.)

- In 2004, a 240,000 sq ft auto parts distribution center caught fire, the fire overwhelmed the sprinkler system and it was the single largest loss of U.S. property that year.
- In Texas, a 100 Unit apartment building suffered $11 million in fire damage when the sprinklers had been shut down due to a leak.
- In Maryland, an historic Court house suffered $8 million in damage, sprinklers were present but there was no report on their effectiveness

Another significant concern with sprinkler reliability is the recent discovery of several faulty sprinkler head designs that have generated recall notices. In the past 15 years, nearly 50 million sprinkler heads have been recalled. This represents a significant issue when calculating the overall reliability of sprinkler systems.

Other reasons sprinkler systems may not function as designed and planned include human intervention such as shutting the system down manually and forgetting to turn it back on, 'contents'- driven fires that are hotter than the sprinklers were designed for, arson, and the biggest concern: seismic ground shaking that disables the water supply system itself.

Taken as a whole, the reliability factor of sprinklers leads the OSFM to conclude that a more conservative, layered fire protection approach to buildings with the higher risk occupancies is warranted.

Natural Hazards: Seismic

California's seismic hazards hardly need describing to the Building Standards Commission. This document will focus on the effect of seismic occurrences to buildings and fires, and the emergency response system.

Seismic events do three things simultaneously related to our concerns:

1. They disrupt the water supply and damage the sprinkler systems.
2. They cause ignitions from a variety of sources.
3. They overwhelm the emergency response system instantly and on a large-scale.

In the Northridge Earthquake, there were 100 ignitions immediately after the ground shake with 30-50 significant fires. The Loma Prieta Earthquake disabled water supplies around the Bay Area, most notably in San Francisco where the fire department had to pump water from the bay to fight fire.

Recently released studies by CalTech in August, 2006 describe building collapse of greater magnitude than predicted, even under modern building codes. The United States Geologic Survey calculates probability of earthquake occurrence and predicts a 62% probability that a 6.7 magnitude or greater quake in the Bay Area in the next 25 years. Remember Northridge was 6.6, and Loma Prieta measured 6.9.

One report from the Association of Bay Area Governments predicts:

> *This earthquake scenario has the potential to cause severe damage to public infrastructure throughout the Bay area, including fire stations and hospitals. A Bay area magnitude 6.7 earthquake may expose 2,970 fire, police and local government buildings to violent shaking. Additionally, 76 hospitals will be exposed to the same level of shaking (ABAG).*

Additionally, the Southern California Earthquake Center predicts 80-90% probability of a 7.0 magnitude quake in Southern California before 2024.

This type of damaging urban earthquake usually causes gas line breaks and electrical shorts, resulting in structure fires. Fire fighting capabilities are severely hampered by water pipe, water tank and roadway damage, along with roadway congestion. The potential for conflagration is significant.

With damaged fire sprinkler systems, limited water supply and severely impacted fire service response, the last line of defense is the building's passive fire suppression components. Even without water or a single on-scene firefighter, the spread of fire may be slowed and potentially contained, by building components such as fire separation walls and fire resistive construction.

(California) Building and Fire codes have advanced incrementally over the past 80 years, primarily triggered by various earthquake and fire disasters. These advances have consistently balanced active and passive fire suppression capabilities. As a result, the current existing building stock, constructed over the past 80 years and serving over 35 million inhabitants, has a balanced and proven fire suppression capability.

The model building code as currently written has a heavy dependence on a functioning fire sprinkler system. This dependence is excessive, particularly in a very seismically active state such as California.

Statistical Relevancy

Much of the opposition about the proposals to amend the Height and Area sections of the IBC centers on the need for statistical data relative to loss history. At both the national and state level, this is not possible. The unfortunate fact is that the National Fire Incident Reporting System (NFIRS) is a voluntary data entry system and complex, and not widely used by fire departments. In California, we have 960 fire departments and in the past 5 years, only 24% have reported to NFIRS consistently. This is a problem we intend to address over time.

Fire departments around the country are the data entry points and their participation is required only if they wish to receive federal grant money. The result is that the body of data to clearly demonstrate the conclusions we seek about the effect of building height and area on life and property loss is non-existent or inconclusive.

It is important to remember that this applies equally to both the current height and area values as well as proposed changes. For this task, statistical analysis will not yield the answers we seek and professional knowledge and experience must guide the decision-making.

Other State Height and Area Amendments

Another issue cited in the opposition to amending the Height and Area provision is that no one else has done it. Ten other states have modified the sections at issue, although none in the exact same manner as California. It should be noted however, that Building Officials Association of Florida submitted Height and Area code proposals at the national hearings that were very similar to California's, as did the National Association of State Fire Marshal's.

The following has been determined from our review of several states; nine have made alterations *other than* editorial changes in these sections and elsewhere, which have significant implications on height and area requirements of the IBC. Along with this, New Jersey is making significant changes in adopting the 2006 IBC. Massachusetts has also made significant changes that will be effective within its borders when it places the IBC in force for the first time. However, none of these changes appear to be as comprehensive as proposed for the CBC. States with significant amendments are highlighted below.

Alaska:

No changes to Chapter 5 but an appendix "L" added to address construction of buildings for North Slope oil production. This section appears a bit odd In that it seems to be a requirement and not an advisory section from the text.

Florida:
Text and content changes - 504.1, 504.2, 506.3

Kentucky:
Text and content changes – 506.3

Massachusetts:
Changes In areas for sprinkler systems – 506.3
Changes In allowable areas for multistory buildings - 506.4 and Table 503

Maryland:
Changes to 504.2

New Hampshire:
Significant content changes to Table 503 + others

New Jersey:
Changes to Table 503 + changes to remain "consistent with BOCA" [see Comment No. 14. pp 8 of NJ Community Affairs Digest]

New York
Some changes to table 503, editorial to 506.3, 506.4

Washington –
Amends Sections 503 and 506 to create significant differences from the IBC Model Code

4. Providing Reasonable Solutions

The concerns raised by the OSFM relative to the model code need focused, reasonable solutions. We are fully aware of the need for a balanced approach to these risk concerns and also support moving forward with a model code that may be a better solution than the older ones. However, we feel that the jury is still out on many of the basic tenets of the IBC, and while it may fully and adequately address public fire and life risk issues, firefighter safety and operations, and reliance on active sprinkler-based protections systems, there is also a distinct possibility it could use improvement.

For this reason, we are proposing to allow an unamended IBC for those occupancies that constitute primarily a property loss risk as opposed to a life risk. Our amendments focus on those high-life risk occupancies only. In addition, our amendments support the conclusions of the IBC but do not extend the full area and height allowances in the modifications sections.

We did not amend Table 503 – Base Tabular Values. We did not remove any sprinkler allowances; we did not reduce the heights of the buildings. Instead we:

- Allow height or area increases, but not both.
- Remove the ability for R occupancies to extend to 4 stories in height with un-sprinklered attic spaces for wood construction types (same as CBC).
- Allow the 200% building area increase modifier but not the 300% one.

Again, these amendments do not affect all occupancies. They will affect only the high-life risk ones of Assembly, Educational, Institutional, Residential, Hazardous and High-rise. This means that the majority of California construction will be completely unaffected by our proposals (unless amended locally). And for those buildings that are affected, we believe the effects will be to allow buildings slightly larger than today's CBC. For those buildings that are affected by the amendments the economic impacts should be negligible compared to today's construction costs. We do acknowledge that the anticipated reduction in construction costs or increases in market share that some industries may have looked forward to will not be as great as the model code predicted. *However, we do not anticipate cost increases from today's environment.*

We strongly believe this is a focused, reasonable approach to the protection of fire and life safety and represents an acknowledgement of the value of the model code while treating the higher risk occupancies more conservatively due to California's unique conditions.

Economic Considerations

Below is a table outlining the construction market In California according to the Construction Industry Research Board, 2005 data. Obtaining construction data by occupancy type in California requires a city-by-city permit search which is beyond the scope of this office. However, CIRB provides equivalent data in general occupancy categories tabulated by dollar value. This gives us an accurate, general picture of the market and allows us to analyze the impact of the SFM amendments on total construction.

It is clear that the greatest construction market segment belongs to the residential sector with 57% attributed to the Single Family Dwelling category. Second in size is the R-2, Multi-Tenant Dwelling segment with 20 % of the total market. Finally, other occupancies addressed in our amendments fall Into the R-1/A-2 category which comprise 1% of the construction volume.

It is estimated that even conservatively including the entire Office/B category (in the event it is a high-rise building), the SFM amendments will only affect 24% of the total market and that is primarily attributable to the R-2 impact. Yet the impact is negligible for the following reasons.

The R-2 construction market In California today is geared toward the land values, architectural and community design standards, and codes we have in place today. It is estimated that the number of 4-story apartment units In California comprise less than 10% of the total of all apartments, so translated this means that the vast majority (90%) of R-2 construction in state today is 2 or 3-story, NFPA 13 or 13R sprinklered, Type V-A (1 HR) construction. Our amendments still allow the same style of construction to continue without change. (Cost Estimate per sq ft is $86.83 per Building Safety Journal, August 2006 - uncorrected for California.)

The three height and area amendments will impact R-2 construction only if the applicant requests to apply the height or area increases over the base allowances. In that case, the applicant can select to upgrade to a full NFPA 13 sprinkler system for height or area increases, or construct fire walls for every 90,000 sq ft. (an increase of 6,000 sq ft compared to our present California Building Code).Today, with the same design request under the CBC, the applicant would be required to do everything the same but erect fire walls (area separation walls in the CBC) at only 84,000 sq ft. Our amendments allow a small increase over today's requirements and still allows for the same number of stories.

If we did not amend this section, we could be left with a wood built apartment building, 4 stories in height with an un-sprinklered attic and nonhabitable rooms and areas (elevator machine rooms, penthouse equipment rooms, crawl spaces) that are beyond the reach of fire department ground ladders of 24 to 35 feet. We believe this is not prudent given all of the risk considerations outlined in this document.

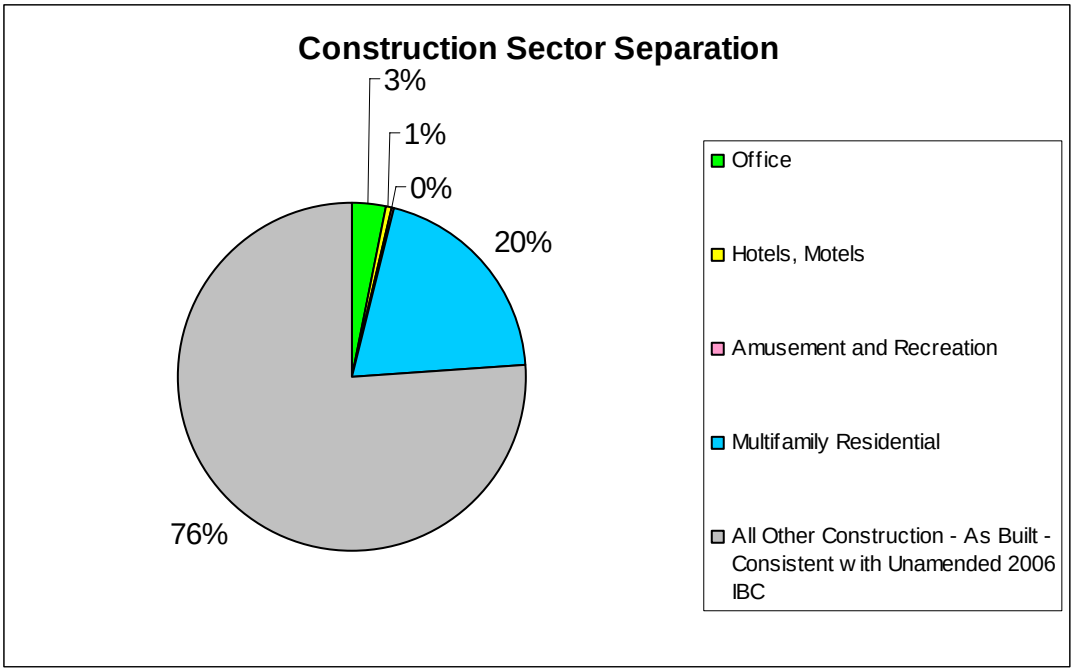
A search of the ten largest non-residential construction projects in California in 2005 show that only two of the ten would be directly affected by the proposed OSFM amendments – a pharmaceutical manufacturing facility and a hotel for a total project value $252 million out of a total 'all construction' value of $ 14.4 billion. (See Appendix D – Ten Largest Construction Projects 2005)

Finally, it is very important to note that the California residential industry supports this package. The National Multi-Housing Council submitted a letter of opposition, but other national residential groups have not. We believe the most affected parties, the California commercial residential builders and owners, are satisfied that our proposals are reasonable and economically neutral. (See Appendix E – How will the changes to the 2006 International Building Code proposed by the California Office of the State Fire Marshal [OSFM] effect R-2 building costs)

Building Configurations Issues

Cost Impact

Non Residential Sector			2005 Construction Dollars from Permit Valuations, Billions of Dollars	Percent of total (%)
	Component	Occupancy		
	Industrial	F	1.693	3
	Office	B	1.881	3
	Stores	M	2.928	5
	Hotels, Motels	R-1	0.384	1
	Parking Garages	S-1	0.437	1
	Amusement and Recreation	A-2	0.165	0
	Alterations - Non Residential		6.901	11
	Total Non Residential - selected segments		14.389	23
Residential Sector				
	Multifamily Residential	R-2	12.26	20
	SFD Residential	R-3	34.88	57
Total State-Wide Construction From CIRB Data			61.529	100



Reference: Construction Industry Research Board, 2006. "Building Permit Summary: California Cities and Countries Data for Calendar Year 2005." Burbank, California.

5. Final Recommendation

California is a leader in the fire and life safety professions. Our building and fire officials are some of the nation's best and speak with considerable experience. We strongly believe the OSFM proposals continue this reputation and allow for change and overall improvement of our building community while at the same time, taking a more conservative approach than the model code in the high risk occupancies.

Reasons supporting this recommendation are numerous.

1. The variety and frequency of natural disasters require greater care and consideration than the model code provides. 75% of the nation's earthquake risk is located In California and we must address this risk though this amendment process.
   .
2. Vulnerable and special need populations are growing and require higher levels of protection than we commonly think of with able-bodied, English-speaking adults.

3. Sprinkler fire protection systems are the best, first defense against life and property loss but are not infallible. Layered fire protection is the appropriate risk mitigation approach.

4. Our life loss history In California continues to need improvement as does firefighter safety. Too many people still die in preventable, mitigable fires.

5. The OSFM is charged with setting the fire and panic standards for California and has done so with an open, participative, researched and professional process for this adoption.

6. The impact of our amendments is not far-reaching or overly restrictive. They are reasonable, focused, limited to those buildings with the greatest risk of life loss, and economically neutral.

7. This package has widespread support of the fire service, building officials, industry, other state agencies, and stakeholders. Any remaining voices of opposition come from primarily specific out-of-state interest groups. The OSFM continues to work with these stakeholders to educate and find common ground as we have done throughout this past year.

8. Adoption of this package will allow for the quickest, smoothest implementation possible of the CBC. Local amendment processes will be minimized and the CBC will be a more consistent document than if these issues were addressed by individual jurisdictions.

The OSFM thanks you for your extraordinary commitment of time to this goal. The Building Standards Commission has performed above and beyond the call.

UPDATES TO THE INITIAL STATEMENT OF REASONS
(Government Code Section 11346.9(a)(1) requires an update of the information contained in the initial statement of reasons. If update identifies any data or any technical, theoretical or empirical study, report, or similar document on which the state agency is relying that was not identified in the initial statement of reasons, the state agency shall comply with Government Code Section 11347.1)

The Initial Statement of Reasons has been updated, as follows:

Revised Statement of Reasons for Section 1022.5 as follows:
OSFM is correlating this amendment which is derived from the amendment proposed to the IBC. The promulgation and format of the IFC and IBC necessitate this action. Code sections that have [B] in front of them are considered by the ICC Building Code Development Committee for the IBC and correlated into the IFC where necessary. OSFM is following the format of the code in these instances; where the primary code is the IBC and OSFM is proposing amendments to the section, those same amendments are correlated into the IFC as amendments.

– Any updates to the Initial Statement of Reasons are included in the Office of the State Fire Marshal changes to accommodate public comments.

MANDATE ON LOCAL AGENCIES OR SCHOOL DISTRICTS
(Pursuant to Government Code Section 11346.9(a)(2), if the determination as to whether the proposed action would impose a mandate, the agency shall state whether the mandate is reimbursable pursuant to Part 7 of Division 4. If the agency finds that the mandate is not reimbursable, it shall state the reasons for the finding(s))

The Office of the State Fire Marshal has determined that the proposed regulatory action WOULD NOT impose a mandate on local agencies or school districts.

OBJECTIONS OR RECOMMENDATIONS MADE REGARDING THE PROPOSED REGULATION(S)
(Government Code Section 11346.9(a)(3)) [List a summary of EACH objection or recommendation regarding the specific adoption, amendment, or repeal proposed, and explanation of how the proposed action was changed to accommodate each objection or recommendation, or the reasons for making no change. This requirement applies only to objections or recommendations specifically directed at the agency's proposed action or to the procedures followed by the agency in proposing or adopting the actions or reasons for making no change. Irrelevant or repetitive comments may be aggregated and summarized as a group]

The following is the Office of the State Fire Marshal's summary of and response to comments specifically directed at the agency's proposed action or to the procedures followed by the agency in proposing or adopting the actions or reasons for making no change:

COMMENTS RECEIVED DURING THE 45-DAY COMMENT PERIOD.
Pursuant to the requirements of Government Code Section 11346.8 (c), and Section 44 of Title 1 of the California Code of Regulations, the California Building Standards Commission provided a notice of proposed adoption by reference of the 2006 edition of the International Building Code with California Amendments into the California Code of Regulations Title 24, Part 2 which were the subject of a Notice of Proposed Action (Register 2006, Volume No. 35-Z, No. Z06-0718-04).

The text with the modifications clearly indicated, were made available to the public for a 45-day written public comment period from September 1, 2006 to October 16, 2006, with a Public Hearing held on October 16, 2006.

Name/Organization: **Stephan Kiefer, Chair - State Code Committee (California Building Officials)**

Comment: Commenter has submitted several editorially revisions for section 202 definition of Noncombustible.

Response: OSFM agrees and will be making the necessary editorial revisions in the final express terms.
OSFM change to accommodate as follows:

*(*Relocated from 2001 CBC 215-N) ***NONCOMBUSTIBLE. [SFM]*** *Noncombustible as applied to building construction material means a material which, in the form in which it is used, is either one of the following:*

> *1. Material of which no part will ignite and burn when subjected to fire. Any material passing ASTM 136 shall be considered noncombustible.*

2. Material having a structural base of noncombustible material as defined in Item 1 above, with a surfacing material not over $^{1}/_{8}$ inch (3.2 mm) thick which has a flame-spread ~~rating~~ index of 50 or less.

"Noncombustible" does not apply to surface finish materials. Material required to be noncombustible for reduced clearances to flues, heating appliances or other sources of high temperature shall refer to material conforming to Item 1. No material shall be classed as noncombustible which is subject to increase in combustibility or flame-spread ~~rating~~ index, beyond the limits herein established, through the effects of age, moisture or other atmospheric condition

Name/Organization: **Marc A. Revere, President (California Fire Chiefs Association)**

Comment: Does not support the joint OSFM and Housing and Community Development amendments to incorporate certain provisions of the International Residential Code into the International Building Code relating to fire resistance construction of walls due to location on property and fire sprinkler requirements for R-3 dwellings.

Response: While the OSFM is not the initiating agency proposing this amendment to IBC Section 419.4 (2-hours wall between dwelling units) and feels that HCD is the agency which should be requested to respond to this particular code provision.

With regard to Section 903.2.7, the OSFM, through both it's Code Development Working Group(s) and Core Group reviewed the provisions outlined in Section 903.2.7 (IBC and IFC, 2006 Edition) and following a lengthy review and deliberation, thereof, advanced the amendment as submitted. The provisions of Section 903.2.7 (IBC and IFC) would have significantly increased the current level of protection, as outlined in the 2001 CBC/CFC for the majority of California jurisdictions and would not have had the statutory authority under present State law for such an expansion of such authority.

It is also noted that during the deliberations and review of this requirement, it was noted that the State is considering the adoption of the International Residential Code (IRC) during the next Annual Code Cycle, and that if the requirement for protection all residential occupancies (Single-Family Dwellings) is approved for the body of that code, then California would move forward with the adoption of such an amendment during those hearings for the California Residential Code to be used as the basis for the California Housing Law adopted and enforced by HCD.

It should also be pointed out that under the provisions of Section 101.8 of the CBC (proposed for 2007) a "City, County, City and County may make amendments, additions, or deletions which are more restrictive and reasonably necessary" provided that they have been supported by "Findings" based on climatic, topographical, or geological conditions. Over the years, various jurisdictions have adopted requirements for the installation of automatic fire sprinkler systems within R-3 occupancies, which will continue to be allowed under the present amendment(s) being moved forward.

Name/Organization: **Randy R. Bruegman, Fire Chief (City of Fresno F/D)**

Comment 1: Do not support the joint OSFM and Housing and Community Development amendments to incorporate certain provisions of the International Residential Code into the International Building Code relating to fire sprinkler requirements for R-3 dwellings.

Comment 2: Commenter points out a possible loophole in R-4 Occupancy requirements relating to fire sprinkler requirements.

Response 1: With regard to Section 903.2.7, the OSFM, through both it's Code Development Working Group(s) and Core Group reviewed the provisions outlined in Section 903.2.7 (IBC and IFC, 2006 Edition) and following a lengthy review and deliberation, thereof, advanced the amendment as submitted. The provisions of Section 903.2.7 (IBC and IFC) would have significantly increased the current level of protection, as outlined in the 2001 CBC/CFC for the majority of California jurisdictions and would not have had the statutory authority under present State law for such an expansion of such authority.

It is also noted that during the deliberations and review of this requirement, it was noted that the State is considering the adoption of the International Residential Code (IRC) during the next Annual Code Cycle, and that if the requirement for protection all residential occupancies (Single-Family Dwellings) is approved for the body of that code, then California would move forward with the adoption of such an amendment during those hearings for the California Residential Code to be used as the basis for the California Housing Law adopted and enforced by HCD.

It should also be pointed out that under the provisions of Section 101.8 of the CBC (proposed for 2007) a "City, County, City and County may make amendments, additions, or deletions which are more restrictive and reasonably necessary" provided that they have been supported by "Findings" based on climatic, topographical, or geological conditions. Over the years, various jurisdictions have adopted requirements for the installation of automatic fire sprinkler systems within R-3 occupancies, which will continue to be allowed under the present amendment(s) being moved forward.

Response 2: OSFM agrees further clarification is warranted and is proposing the following revision to 903.2.7 Exception 1.
OSFM change to accommodate as follows:

903.2.7 Group R An automatic sprinkler system installed in accordance with Section 903.3 shall be provided throughout all buildings with a Group R fire area.

Exceptions:
1. Detached one- and two-family dwellings and multiple single-family dwellings (town houses) not more than three stories above grade plane in height with a separate means of egress, unless specifically required by other sections of this Code or classified as Group R-4.
2. Group U private garages accessory to a Group R-3 occupancy.
3. Group R-3.1 occupancies not housing bedridden clients, not housing nonambulatory clients above the first floor, and not housing clients above the second floor.
4. Pursuant to Health and Safety Code Section 13113 occupancies housing ambulatory children only, none of whom are mentally ill or mentally retarded, and the buildings or portions thereof in which such children are housed are not more than two stories in height, and buildings or portions thereof housing such children have an automatic fire alarm system activated by approved smoke detectors.
5. Pursuant to Health and Safety Code Section 13143.6 occupancies licensed for protective social care which house ambulatory clients only, none of whom is a child (under the age of 18 years), or who is elderly (65 years of age or over).

An automatic sprinkler system designed in accordance with Section 903.3.1.3 shall not be utilized in Group R-4.

Revised Statement of Reasons for Section 903.2.7 as follows:
OSFM is proposing the amendment of this section to incorporate critical elements of the International Residential Code (IRC). During this rulemaking the Department of Housing and Community Development (HCD) was not able to propose adoption of the IRC as originally planned. The IRC and the International Building Code (IBC) contain conflicting requirements in some areas as they relate to one and two family dwellings and Group U private garages accessory to them. In an effort to transition from the IBC to a future adoption of the IRC, OSFM is incorporating amendments to correlate some of the more critical conflicts into this rulemaking.

The 2006 IRC does not require fire sprinkler systems in detached one- and two- family dwellings. The scope provisions contained in Section 101.2 of the 2006 IBC specify that one- and two- family dwellings comply with the provisions of the IRC. This amendment aligns the requirement contained in the IRC with those of the IBC by specifying that one- and two family dwellings may be constructed without fire sprinklers unless required by other sections of the code. The requirement for fire sprinklers in one- and two- family dwellings is most common in licensed care occupancy groups regulated by OSFM.

In addition OSFM is proposing to bring forth these requirements and amendments regarding Group R occupancies. This amendment will exempt fire sprinklers under certain conditions. This amendment does not create a change in regulatory effect.

This amendment is also consistent with the previous requirements contained in the 2001 Triennial California Building Standards Code. This amendment does not create a change in regulatory effect.

The actions described above are reasonably necessary to carry out the purpose for which it is proposed. The rationale for these actions is to establish minimum requirements for the prevention of fire and for the protection of life and property against fire and panic in occupancies that are addressed in the 2006 International Fire Code and published as the 2007 California Building Code pursuant to Health and Safety Code Section 18949.2, 13108, 13113, 13114, 13131.5, 13143 and 17921.

Name/Organization: **Richard Skaff, Executive Director (Designing Accessible Communities) and Connie Arnold, Disability Policy Consultant**

Comment 1. Commenter states that the amendments to 907.9.1 reduce existing CBC requirements

Comment 2. Commenter request that OSFM not remove “Any other area for common use” from section 907.9.1.1.

Comment 3. Commenter states that Table 907.9.1.3 reduces existing ADAAG requirements.

Comment 4. Commenter opposes the adoption or amendments to sections 1002.1, 1003.1, 1003.3.4, 1003.5, 1007.1, 1007.2, 1007.2.1, 1007.3, 1007.4, 1007.5, 1007.5.1, 1007.6, 1007.6.1, 1007.6.2, 1007.6.3, 1007.6.3.1, 1007.6.4, 1007.6.5, 1007.7, 1007.8, 1007.8.1, 1007.8.2, 1007.8.3, 1007.9, 1008.1.8.6, 1014.4, 1014.4.1, 1114B.2, 1114B.2.1, 1114B.2.21114B.2.2.1, 1114B.2.2.2, 1114B.2.2.3, 1114B.2.2.4, 1114B.2.2.4.1, 1114B.2.2.4.2, 1114B.2.2.5 and 1114B.2.3. Commenter states, “We believe that the State of California and specifically the State Fire Marshal have not taken the appropriate measures including researching possible effective means of egress from buildings for people with disabilities. We believe that to support these provisions will allow this failure to protect the lives of persons with disabilities to continue.”

Response 1. OSFM disagrees, without the deletion of the defined term “exit” and proposing to add enclosed exit stairways, exterior exit stairs, and exterior exit ramps this exception would delete the requirement for visible alarm notification appliances in exit passageways and horizontal exits. The definition of "exit" in Section 1002 includes exit passageways. Omitting visual appliances from exit passageways is inappropriate. Exit passageways can be used in the same manner as corridors. The amended language provides clarification where visual alarm notification appliances are not required in the exit and exit discharge areas. This provides consistency with NFPA 72.

Response 2. OSFM disagrees, this language for common use areas is now included in the main body of section 907.9.1.1 and is no longer needed as a separate item.

Response 3. In response to comment received during the 45-day comment period stating concerns that this section may reduce current requirements for visual and audible alarms, OSFM is proposing to make an editorial amendment to add a reference to existing requirements in Chapter 11B, Section 1111B.4.5, Table 11B-3, and Table 11B-4.

The purpose of the note is to coordinate with Chapter 11B Section 1111B.4.5 and Table 11B-3 and Table 11B-4. For occupancies required to comply with the access provisions in Chapter 11B the required number of visible and audible alarms are required for R-1 occupancies with less than 6 sleeping units. This reference adds clarification to the code for those occupancies required to comply with 11B.
OSFM change to accommodate as follows:

TABLE 907.10.1.3
VISIBLE AND AUDIBLE ALARMS

NUMBER OF SLEEPING UNITS	SLEEPING UNITS WITH VISIBLE AND AUDIBLE ALARMS
6 to 25	2
26 to 50	4
51 to 75	7
76 to 100	9
101 to 150	12
151 to 200	14
201 to 300	17
301 to 400	20
401 to 500	22
501 to 1,000	5% of total
1,001 and over	50 plus 3 for each 100 over 1,000

[SFM] In addition to these requirements, see Chapter 11B Section 1111B.4.5, Table 11B-3, and Table 11B-4.

Revised Statement of Reasons for TABLE 907.10.1.3 as follows:
In response to comment received during the 45-day comment period stating concerns that this section may reduce current requirements for visual and audible alarms, OSFM is proposing to make an editorial amendment to add a reference to existing requirements in Chapter 11B, Section 1111B.4.5, Table 11B-3, and Table 11B-4.

The purpose of the note is to coordinate with Chapter 11B Section 1111B.4.5 and Tables 11B-3 and 11B-4. For occupancies required to comply with the access provisions in Chapter 11B the required number of visible and audible alarms are required for R-1 occupancies with less than 6 sleeping units. This reference adds clarification to the code for those occupancies required to comply with 11B

The actions described above are reasonably necessary to carry out the purpose for which it is proposed. The rationale for these actions is to establish minimum requirements for the prevention of fire and for the protection of life and property against fire and panic in occupancies that are addressed in the 2006 International Fire Code and published as the 2007 California Building Code pursuant to Health and Safety Code Section 18949.2, 13108, 13113, 13114, 13131.5, 13143 and 17921.

Response 4. OSFM disagrees with the comment. It is OSFM understanding, following an in depth analysis of the building standards contained within the IBC, that the access requirements are similar to that of the current CBC or provide greater accessibility. The comment lacks specificity in identifying the adoption, amendment, or repeal of regulation that is being proposed. OSFM in coordination with DSA/AC and HCD will take the concerns expressed in this comment regarding effective means of egress from buildings for people with disabilities under consideration in the development of future rulemaking packages.

The foundation and philosophy used for the development of the fire and life safety provisions of the California Building and Fire Codes using the International Building and Fire Codes as the base document. The objective was to develop an adoption package that will include model code language from the 2006 IBC and IFC and current applicable California amendments. The process was to utilize a holistic approach to public safety when developing the state construction codes and evaluating the proposed amendments to those codes. The intent is that the final adoption package will include amendments necessary to reasonably maintain a substantially equivalent level of fire and life safety in California.

Among the decisions that were made was the extent of amendment to the IBC and IFC that the SFM would propose based on recommendations from a Core Committee and various stakeholder groups. It is the intent of the OSFM that the new CBC and CFC will provide the substantially equivalent level of protection that we have achieved in our State, when viewed holistically.

Additionally, OSFM has made every effort to coordinate the exiting, means of egress and other pertinent fire and panic safety provisions in chapters 9 and 10 with the Division of State Architect (DSA) and the Department of Housing and Community Development (HCD). DSA and HCD are the lead agencies for developing the State disabled access regulations and requirements found in the California Building Code.

Name/Organization: **Sharon Toji (Access Communications)**

Comment: Commenter request that an editorial modification be made to section 907.10.1.5 to change the term "which" to "who" when used as it relates to persons.

Response: OSFM agrees and proposes to make the editorial revision.
OSFM change to accommodate as follows:

[F] 907.10.1.5 Group I-1, R-3.1 and R-4 *Protective social care facilities which house persons ~~which~~ who are hearing impaired, shall be provided with notification appliances for the hearing impaired installed in accordance with NFPA 72 and which shall activated upon initiation of the fire alarm system or the smoke alarms.*

Name/Organization: **Paul Inouye (Milpitas Fire Department)**

Section 3704.2.2.7. Change 660 gallons (2498L) to 1,700 pounds (722 kg). This editorial change is needed to maintain consistency with the present quantities stated in the 2006 IFC, Section 3704.2.2.7 Exception 2.

Response: OSFM agrees that the text shown in the Initial Express Terms reflected the 2003 IFC language. OSFM has made the editorial change to reflect the measurement for pounds in IFC, Section 3704.2.2.7 Exception 2.
OSFM Change to Accommodate as follows:

3704.2.2.7 Treatment systems. The exhaust ventilation from gas cabinets, exhausted enclosures and gas rooms, and local exhaust systems required in Sections 3704.2.2.4 and 3704.2.2.5 shall be directed to a treatment system. The treatment system shall be utilized to handle the accidental release of gas and to process exhaust ventilation. The treatment system shall be designed in accordance with Sections 3704.2.2.7.1 through 3704.2.2.7.5 and Section 505 of the ~~*International*~~ *California Mechanical Code*.

Exceptions: 1. Highly toxic and toxic gases-storage. A treatment system is not required for cylinders, containers and tanks in storage when all of the following controls are provided:

1.1. Valve outlets are equipped with gas-tight outlet plugs or caps.
1.2. Handwheel-operated valves have handles secured to prevent movement.
1.3. Approved containment vessels or containment systems are provided in accordance with Section 3704.2.2.3.

2. Toxic gases—use. Treatment systems are not required for toxic gases supplied by cylinders or portable tanks not exceeding 1,700 pounds (772 kg) water capacity when the following are provided:

2.1. A *listed or approved* gas detection system with a sensing interval not exceeding 5 minutes.
2.2. An *listed or* approved automatic-closing fail-safe valve located immediately adjacent to cylinder valves. The fail-safe valve shall close when gas is detected at the PEL by a gas detection system monitoring the exhaust system at the point of discharge from the gas cabinet, exhausted enclosure, ventilated enclosure or gas room. The gas detection system shall comply with Section 3704.2.2.10.

Name/Organization: **California Metro Fire Chiefs (Alameda County F/D, Contra Costa County F/D, Kern County F/D, Long Beach F/D, Los Angeles County F/D, Los Angeles F/D, Oakland F/D, Orange County F/D, Sacramento F/D, Sacramento Metropolitan F/D)**

Comment: Request OSFM to incorporate PRC 4291 and provisions of 2000 UFC Appendix 2A into Chapter 47, Section 4706 and 4707.

Response: OSFM can not advance this proposal for the following reasons:

- These provisions are non-building standards that must be promulgated through the Office of Administrative Law process into Title 19.
- OSFM considers the provision found in UFC Appendix 2A may be best handled through the local adoption process, furthermore the majority of the provisions in Appendix 2A are found in the International Wildland Urban Interface Code.
- Currently OSFM is studying the issues related to defensible space regulations found in the different National model codes for possible inclusion into the code.
- OSFM believes that further public participation is warranted prior to the inclusion of these provisions into the code.

Name/Organization: **Kevin Reinertson, Senior Deputy State Fire Marshal, Regulations Coordinator, Office of the State Fire Marshal**

Comment 1.
The amendment is necessary to correct an editorial error made during our original submittal. OSFM is proposing to relocate the last paragraph to follow item 3 "*Automatic fire sprinkler systems"*. This editorial amendment is necessary to correct an error made during the relocation requested by the Code Advisory Committee**.** Furthermore the January 1, 2008 date needs to be removed because it is no longer applicable. This date was established by a State Fire Marshal Advisory group on the subject before California Building and Fire Code adoptions time frames were established, and inadvertently retained in subsequent submittals.
OSFM change to accommodate as follows:

904.11 Commercial cooking systems. ~~*The automatic fire-extinguishing system for commercial cooking systems shall be of a type recognized for protection of commercial cooking equipment and exhaust systems of the type and arrangement protected. Pre-engineered automatic dry- and wet-chemical extinguishing systems shall be tested in accordance with UL 300 and listed and labeled for the intended application. Other types of automatic fire-extinguishing systems shall be listed and labeled for specific use as protection for commercial cooking operations. The system shall be installed in accordance with this code, its listing and the manufacturer's installation instructions. Automatic fire-extinguishing systems of the following types shall be installed in accordance with the referenced standard indicated, as follows:*~~

~~1. Carbon dioxide extinguishing systems, NFPA 12.~~
~~2. Automatic sprinkler systems, NFPA 13.~~
~~3. Foam-water sprinkler system or foam-water spray systems, NFPA 16.~~
~~4. Dry chemical extinguishing systems, NFPA 17.~~
~~5. Wet-chemical extinguishing systems, NFPA 17A~~

Commercial cooking equipment that produce grease laden vapors shall be provided with a Type I Hood, in accordance with the California Mechanical Code, and an automatic fire extinguishing system that is listed and labeled for its intended use as follows:

1. Wet chemical extinguishing system, complying with UL 300.
2. Carbon dioxide extinguishing systems,
3. Automatic fire sprinkler systems.

All existing dry chemical and wet chemical extinguishing systems shall comply with UL 300, no later than the second required servicing of the system following the effective date of this section ~~*or January 2008, which ever occurs first,*~~

Exception *Public schools kitchens, without deep-fat fryers, shall be upgraded to a UL 300 compliant system during state funded modernization projects that are under the jurisdiction of the Division of the State Architect*

All systems shall be installed in accordance with the California Mechanical Code, appropriate adopted standards, their listing and the manufacturers' installation instructions.

Exception: Factory-built commercial cooking recirculating systems that are tested*, listed, labeled and installed* in accordance with UL 710B~~. and listed, labeled and installed in accordance with Section 304.1 of the *International Mechanical Code*~~.

~~*All existing dry chemical and wet chemical extinguishing systems shall comply with UL 300, no later than the second required servicing of the system following the effective date of this section or January 2008, which ever occurs first,*~~

Comment 2.
OSFM is proposing an editorial amendment to correct the spelling of aisles.
OSFM change to accommodate as follows:

907.4.6 **Protective covers.** The fire code official is authorized to require the installation of listed manual fire alarm box protective covers to prevent malicious false alarms or to provide the manual fire alarm box with protection from physical damage. The protective cover shall be transparent or red in color with a transparent face to permit visibility of

the manual fire alarm box. Each cover shall include proper operating instructions. A protective cover that emits a local alarm signal shall not be installed unless approved. *Each cover shall not exceed a combined projection over 4 inches (102 mm) from the surface of the wall into walks, halls, corridors, passageways or ~~isles~~ aisles.*

Comment 3.
The amendment is necessary to correct an error made during our original submittal. Previous versions of the CBC have contained requirements for areas of Evacuation Assistance in Chapters 11A and 11B. The 2006 IBC contains similar provisions in Chapter 10. OSFM is proposing to eliminate the requirements in Chapters 11A and 11B. This amendment is necessary to correct an error made during the relocation of the requirements from Chapter 11A to Chapter 10. The original intent was to bring this exception forward and incorporate it into Chapter 10 in the same manner the other requirements had been relocated to Chapter 10, it was inadvertently left out. OSFM is proposing to correct this error and is showing the exception as it should have been originally. The proposed amendment does not represent change in its effect from the 2001 Triennial California Building Standards Code. The exception was previously located in Section 1118A.2.2 and 1114B.2.2.2.
OSFM change to accommodate as follows:

1007.6.1 Size. Each area of refuge shall be sized to accommodate ~~one~~ *two* wheelchair space*s that are not less than* ~~of~~ 30 inches by 48 inches (762 mm by 1219 mm)*. The total number of such 30-inch by 48-inch (762 mm by 1219 mm) spaces per story shall be not less than one for every 200 persons of calculated occupant load served by the area of rescue refuge.* ~~for each 200 occupants or portion thereof, based on the occupant load of the area of refuge and areas served by the area of refuge.~~ Such wheelchair spaces shall not reduce the required means of egress width. Access to any of the required wheelchair spaces in an area of refuge shall not be obstructed by more than one adjoining wheelchair space

> ***Exception:*** *The enforcing agency may reduce the size of each required area of refuge to accommodate one wheelchair space that is not less than 30 inches by 48 inches on floors where the occupant load is less than 200.*

Comment 4.
There are no provisions in 716.5.1 Fire walls, and 716.5.2 Fire barriers, requiring ducts and air transfer openings in horizontal exit walls to be protected by anything other than fire dampers. It is currently the intent of the code to provide protection from smoke in addition to fire for horizontal exits. It appears the lack of such implementing code language is an oversight in the current code.
OSFM change to accommodate as follows:

1022.5 Ducts and air transfer openings. [SFM] *In high-rise buildings, Group A, E, H, I and L occupancies and other applications listed in Section 111 regulated by the Office of the State Fire Marshal, ducts and air transfer openings through fire walls or fire barriers, forming a horizontal exit, shall be designed and protected in accordance with Section 716 in order to afford safety from both fire and smoke in the refuge area. All ducts and air transfer openings shall be protected by listed combination fire/smoke dampers.*

Revised Statement of Reasons for Section 1022.5 as follows
SFM is correlating this amendment which is derived from the amendment proposed to the IBC. The promulgation and format of the IFC and IBC necessitate this action. Code sections that have [B] in front of them are considered by the ICC Building Code Development Committee for the IBC and correlated into the IFC where necessary. SFM is following the format of the code in these instances; where the primary code is the IBC and SFM is proposing amendments to the section, those same amendments are correlated into the IFC as amendments. SFM is also proposing to change the term International to California.

The actions described above are reasonably necessary to carry out the purpose for which it is proposed. The rationale for these actions is to establish minimum requirements for the prevention of fire and for the protection of life and property against fire and panic in occupancies that are addressed in the 2006 International Building Code and published as the 2007 California Building Code pursuant to Health and Safety Code Section 18949.2, 13108, 13113, 13114, 13131.5, 13143 and 17921.

COMMENTS RECEIVED DURING THE 15-DAY COMMENT PERIOD.
Pursuant to the requirements of Government Code Section 11346.8 (c), and Section 44 of Title 1 of the California Code of Regulations, the California Building Standards Commission provided a notice of proposed adoption by reference of the 2006 edition of the International Fire Code with California Amendments into the California Code of

Regulations Title 24, Part 9 which were the subject of a Notice of Proposed Action (Register 2006, Volume No. 35-Z, No. Z06-0718-04).

Subsequent to the original public comment period, text with the nonsubstantive modifications clearly indicated, was made available to the public for a 15-day public written comment period from October 26, 2006 to November 9, 2006.

COMMENTS RECEIVED AFTER CLOSE OF THE PUBLIC COMMENT PERIOD:

Name/Organization: **Noel Neudeck, President (Wheelchair Access Now Today)**

Comment: **Section 1003.3.2 Alarms.** An approved red color flashing strobe/audible sprinkler flow alarm shall be provided on the building in an approved location. A single approved red color flashing strobe/audible sprinkler flow alarm shall be provided in the interior of the building in a normally occupied location. Actuation of the alarm shall be as set forth in the Fire Code (See Section 9003, Standard n.2.9).

Response: OSFM has reviewed the above proposed modifications/amendments to the respective section and finds that due to the nature of the proposal to propose these various amendments forward at this point would violate the Building Standards Law and the APA. OSFM believes that further public participation is required and public notice be given prior to making revision to sections that had not been originally noticed for proposed for amendment. OSFM will take the concerns expressed under consideration in the development of future rulemaking packages.

DETERMINATION OF ALTERNATIVES CONSIDERED AND EFFECT ON PRIVATE PERSONS
(Government Code Section 11346.9(a)(4))

The Office of the State Fire Marshal has determined that no alternative considered would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective and less burdensome to affected private persons than the adopted regulation.

REJECTED PROPOSED ALTERNATIVE THAT WOULD LESSEN THE ADVERSE ECONOMIC IMPACT ON SMALL BUSINESSES: (Government Code Section 11346.9(a)(5))

No proposed alternatives were received by the Office of the State Fire Marshal .

COMMENTS MADE BY THE OFFICE OF SMALL BUSINESS ADVOCATE
(Government Code Section 11347.6) [List each comment by the Trade and Commerce Agency directed at the proposed regulation or at the procedures followed by the Agency in proposing or adopting the regulation, and a response to each comment, including the basis why a comment was rejected, if applicable.]

No comments were received from the Office of Small Business Advocate.

COMMENTS MADE BY THE TRADE AND COMMERCE AGENCY
(Government Code Section 11347.6) [List each comment by the Trade and Commerce Agency directed at the proposed regulation or at the procedures followed by the Agency in proposing or adopting the regulation, and a response to each comment, including the basis why a comment was rejected, if applicable.]

No comments were received from the Trade and Commerce Agency.

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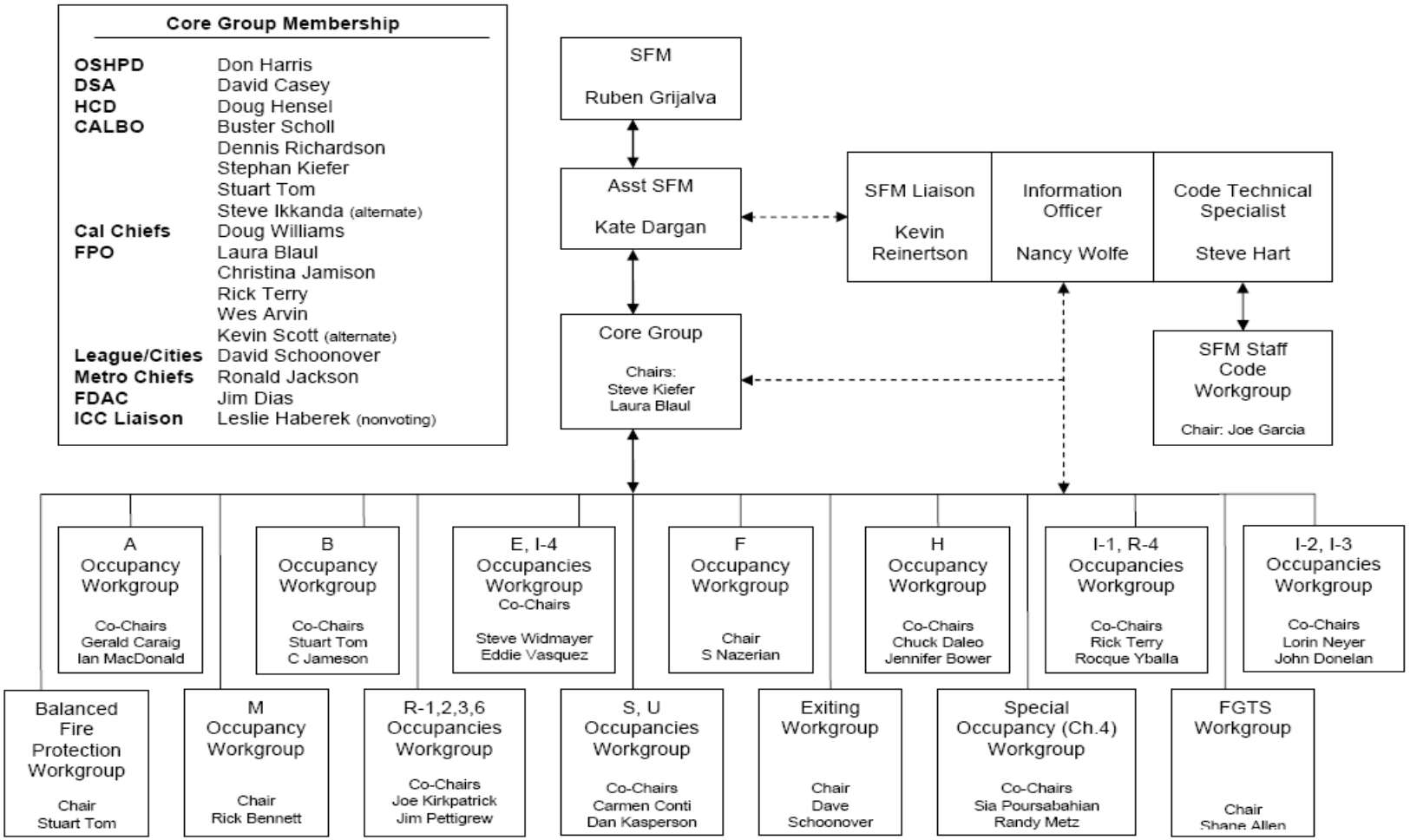
Appendix A

SFM Code Adoption Project Organization

03/01/06



Appendix B

SFM Code Adoption Project Calendar of Events		
September 2005	1	Establish project goals; assemble Core Group and Workgroup members; identify process
	6	Core Group Kickoff
	16	Initial Workgroup meeting (Irvine)
	21	Initial Workgroup meeting (Sacramento)
January 2006	5	Deadline for workgroups to submit first recommendation drafts
	9-11	Core Group review of Workgroup recommendations (Sacramento)0
	20	SFM Code Adoption Stakeholders meeting (Sacramento)
	24	Core Group Conference Call
	31	SFM Staff Workgroup meeting (Sacramento)
February 2006	1	SFM Staff Workgroup (continues)
		First draft of SFM's CBC/CFC "monograph" to be posted on website
	7	Core Group Conference Call
	10	Final date for Workgroups to submit recommendations
	13-14	Core Group/Workgroup Leaders meet to review/comment on Workgroup recommendations (SFM - Sacramento)
	21	Core Group Conference call
	22	SFM Code Adoption Stakeholders meeting (OCFA - Irvine)
	23	Core Group/Workgroup Leaders meet to review/comment on Workgroup recommendations (OCFA - Irvine)
March 2006	1	SFM posts final draft monograph of recommendations to website
	2-3	SFM to present monograph to CALBO Annual meeting
	7	Core Group Conference Call
	17	Core Group meeting to review "final package" of Workgroup recommendations (Buellton)
	21	Core Group Conference Call
	24	SFM Code Adoption Stakeholders meeting (San Jose)
April 2006	1	Final package to Chief Grijalva with Core Group recommendations; package includes identification of critical elements (e.g., height/area tables, area separations, Group L Occupancies, Group R, Division 3 Occupancies including residential care facilities, etc.)
	18	Core Group Conference Call
May 2006	2	Core Group Conference Call
	15	SFM submits proposed package to California Building Standards Commission

Appendix C

Reliability of Automatic Sprinkler Systems

William E. Koffel, P.E.

Revised January 2006[1]

Whether one is preparing a performance design or working with a prescriptive code, the reliability of fire protection systems and features must be considered. Budnick[2] explains that reliability includes both operational reliability and performance reliability. The operational reliability is a measure of the probability that a system or component will operate as intended when needed. The performance reliability is a measure of the adequacy of the system once it has operated. While critical for all fire protection features and systems, this paper will focus on the reliability of automatic sprinkler systems, in particular the operational reliability.

When the original paper on this subject was prepared by this same author, critics immediately claimed that the data was manipulated and the operational reliability of sprinkler systems was being represented as being too low. However, many of the critics failed to consider the aspects of uncertainty addressed in the paper. Since that time, NFPA has released two additional reports, the latter of which specifically confirms that the operational reliability of sprinkler systems, as reported in the original paper, accurately represented the data upon which the paper was based. The recent NFPA reports utilize more current data which cannot be combined with the original data due to differences in the reporting system. The more recent NFPA reports are included in this revised paper.

Past Studies

Table 1 provides a list of previous studies in which the reliability of automatic sprinkler systems has been documented. The scope, breadth, and reporting periods of the various studies vary significantly. One must also carefully review the scope of each study.

Table 1

Reference	Reliability of Success	Comments
Marryat[3]	99.5	Inspection, testing, and maintenance exceeded normal expectations and higher pressures
Maybee[4]	99.4	Inspection, testing, and maintenance exceeded normal

[1] There are two primary differences between this paper and earlier papers. The first is that this paper, along with the paper dated September 2005, updates the original paper using data provided in the August 2005 NFPA report (referenced later in the paper). The second change, which is a change between the September 2005 paper and this paper, is the overall reliability number for automatic sprinklers systems as reported by the current NFPA data was changed from 91% to 89%. This change occurred after discussions with Dr. Hall in which he suggested that the more correct number to use would be 89%. The 89% number is calculated using an operational reliability of 93% and a performance reliability of 96% as reported in the August 2005 NFPA report.

[2] Budnick, Edward K. , P.E., "Automatic Sprinkler System Reliability," *Fire Protection Engineering*, Society of Fire Protection Engineers, Winter 2001

[3] Marryat, H. W., *Fire: A Century of Automatic Sprinkler Protection in Australia and New Zealand 1886 – 1986,* Australia Fire Protection Association, Melbourne, Australia.

		expectations.
Powers[5]	98.8	Office buildings only in New York City
Powers[6]	98.4	Other than office buildings in New York City
Finucane et al.[7]	96.9 – 97.9	
Milne[8]	96.6/97.6/89.2	
NFPA[9]	88.2 – 98.2	Data provided for individual occupancies – total for all occupancies was 96.2%.
Linder[10]	96	
Richardson[11]	96	
Miller[12]	95.8	
Powers[13]	95.8	Low rise buildings in New York City
US Navy[14]	95.7	1964 – 1977
Smith[15]	95	UK data
Miller[16]	94.8	
Budnick[17]	92.2/94.6/97.1	Values are lower in commercial uses (excludes institutional and residential)
Kook[18]	87.6	Limited data base
Ramachandran[19]	87	Increases to 94 percent if estimate number of fires not reported is included and based upon 33% of fires not reported to fire brigade.
Factory Mutual[20]	86.1	1970 – 1977
Miller[21]	86	Commercial uses (excludes institutional and residential)

[4] Maybee, W. W. "Summary of Fire Protection Programs in the U.S. Department of Energy—Calendar Year 1987," U.S. Department of Energy, Frederick, MD, August 1988.
[5] Powers, R. W. "Sprinkler Experience in High-Rise Buildings (1969-1979)," *SFPE Technology Report 79-1*, Society of Fire Protection Engineers, Boston, MA, 1979.
[6] Powers, R. W., ibid
[7] Finucane, M, and Pickney, D. "Reliability of Fire Protection and Detection Systems," United Kingdom Atomic Energy Authority, University of Edinburgh, Scotland.
[8] Milne, W. D., "Automatic Sprinkler Protection Record, "*Factors in Special Fire Risk Analysis*, Chapter 9, pp. 73-89.
[9] NFPA. "Automatic Sprinkler Performance Tables, 1970 Edition," *Fire Journal*, July 1970, pp. 35-39.
[10] Linder, K. W. "Field Probability of Fire Detection Systems," Balanced Design Concepts Workshop, NISTIR 5264, R.W. Bukowski (ed.), Building and Fire Research Laboratory, National Institute of Standards and Technology, September 1993.
[11] Richardson, J. K. "The Reliability of Automatic Sprinkler Systems," *Canadian Building Digest*, Vol. 238, July 1985.
[12] Miller, M. J. "Reliability of Fire Protection Systems," *Loss Prevention ACEP Technical Manual 8*, 1974.
[13] Power, R. W., ibid.
[14] Kelly, Kevin J. "Trade Ups", *Sprinkler Quarterly*, Summer 2003
[15] Smith, Frank. "How Successful are Sprinklers," *SFPE Bulletin*, Vol. 83-2, April 1983, pp 23-25.
[16] Miller, M. J., ibid.
[17] Budnick, Edward J., ibid.
[18] Kook, K. W. "Exterior Fire Propagation in a High-Rise Building," Master's Thesis, Worcester Polytechnic Institute, Worcester, MA, November 1990.
[19] Ramachandran, Ganapathy. "The Economics of Fire Protection," New York: E & FN Spon, 1998.
[20] Kelly, Kevin J., ibid.

Oregon State Fire Marshal[22]	85.8	1970 – 1978
Taylor[23]	81.3	Limited data base

Operational Reliability

Table 1 includes both domestic and international estimates regarding the reliability of sprinklers. Many of the studies include limited data bases and are based upon experience over 15 years ago. A review of more recent fire experience in the United States indicates that the reliability of automatic sprinkler systems, while still good, may not be as high as reported by several of the studies in Table 1. In an NFPA report[24], Rohr provides considerable data regarding the fire experience in the United States in buildings protected with automatic sprinklers.

The NFPA data over a ten year reporting period regarding the operational reliability of automatic sprinkler systems can be summarized as indicated in Table 2.

Table 2

Property Use	Estimated Number of Fires with Sprinklers Present (1989-1998)	% of Fires With Sprinklers Where Sprinklers Operated
Public Assembly	30,000	73.9%
Educational	11,700	79.6%
Health Care and Correctional Facilities	41,900	80.0%
All Residential	87,500	84.6%
One- and two- family dwellings	16,900	80.0%
Apartments	50,000	87.6%
Hotels and Motels	12,900	82.7%
Department Stores	28,700	84.9%
Offices	10,700	80.6%
Industrial Facilities	4,100	85.9%
Manufacturing Facilities	49,800	91.1%
Storage Properties	9,000	84.0%
Total All Uses	273,400	83.6%

NFPA provided an update on the original report using both the original data reported in Table 2 and data for a period of one year (1999). Due to differences in the reporting system, the two data sets should not be combined. Table 3 summarizes the data as reported by NFPA using 1999 data.

Table 3

Property Use	Estimated Number of Fires with Sprinklers Present (1999)	% of Fires With Sprinklers Where Sprinklers Operated
Public Assembly	4,200	70.2%

[21] Miller, M. J., ibid.
[22] Kelly, Kevin J., ibid.
[23] Taylor, K. T. "Office Building Fires…A Case for Automatic Fire Protection," *Fire Journal*, 84(1), January/February 1990, pp. 52-54.
[24] Rohr, Kimberly, "U.S. Experience With Sprinklers," National Fire Protection Association, September 2001

Educational	1,810	76.2%
Health Care and Correctional Facilities	3,980	80.5%
All Residential	15,871	86.3%
One- and two- family dwellings	6,620	81.8%
Apartments	8,770	89.2%
Hotels and Motels	1,650	90.4%
Stores and Offices	5,000	
Department Stores	930	88.3%
Offices	1,520	81.1%
Industrial Facilities	500	88.3%
Manufacturing Facilities	5,910	90.7%
Storage Properties	1,690	84.5%
Other	1,300	
Total All Uses	41,480	78.8%

Although the 1999 data would indicate that the operational reliability of automatic sprinkler systems has decreased slightly from the previous ten year data base, the decrease may not be statistically significant since the data base is substantially smaller.

As with any data collection system, there are some limitations regarding the accuracy of the data. While identified as a limitation in some of the studies reported in Table 1, it should be noted that the Estimated Number of Fires with Sprinklers Present in Tables 2 and 3 do not include fires which were too small to operate a sprinkler. For example, if the incident report indicated that the fire was too small to operate a sprinkler, that data point is not included in Tables 2 and 3.

The data in Tables 2 and 3 do not include fires that are not reported to fire departments. The data does not discern whether the systems have been properly designed, installed, and maintained which would obviously increase the operational reliability of automatic sprinkler systems. Also not included is the type of sprinkler system provided and as such, it is not clear that sprinklers were present in the area of origin for all the reported fires. For example, it is possible that sprinklers were present in the building and the incident report may indicate the presence of sprinklers. However, the area of origin may not be in an area where sprinklers were present and there is no way to discern this from the data. Using an older data base, a separate NFPA report[7] indicated that fires originated in an area that was not sprinklered in partially sprinklered buildings constitute 7.8% of the sprinkler system failures.

In the August 2005 report[25], NFPA utilizes information available in the new data system to better document the fires that occur within an area where sprinklers are not present. The adjusted data in the August 2005 report deletes all data in which sprinklers were reported as not being present in the area of fire origin from the data base if sprinklers did not operate and if sprinklers operated but were not effective. The information contained in the report does not allow one to determine if this may result in overestimating sprinkler system reliability. For example, if a fire occurs in an area in which sprinklers are not present and the reference standard does not require sprinklers to be present, the incident may be eliminated from the analysis based upon the entry that sprinklers were not in the area of fire origin. This is different than the issue where the only selected areas of a building are protected and the fire occurs in a space that was not intended to be protected by automatic sprinklers.

Unfortunately the August 2005 NFPA report does not provide the same level of data as provided in previous reports. Instead, the report merely provides percentage values for the time period 1999-2002. Therefore, Table 4 does not contain the number of incidents as provided in the previous tables. The first

[25] Rohr, Kimberly and John R. Hall, Jr, "U.S. Experience With Sprinklers and Other Fire Extinguishing Equipment," National Fire Protection Association, August 2005.

column of percentages in Table 4, labeled “Nonadjusted,” is provided for comparison with Tables 2 and 3. The second column of percentages in Table 4, labeled “Adjusted,” provides the data as “corrected” by NFPA. Where data is not provided in Table 4, the information is not provided in the August 2005 report but was provided in one of the previous reports.

Table 4

Property Use	Nonadjusted Data (1999-2002) - % of Fires With Sprinklers Where Sprinklers Operated	Adjusted Data (1999-2002) - % of Fires With Sprinklers Where Sprinklers Operated
Public Assembly	65%	90%
Educational	74%	93%
Health Care and Correctional Facilities	80%	95%
All Residential	88%	97%
One- and two- family dwellings		94%
Apartments		98%
Hotels and Motels		96%
Stores and Offices	81%	91%
Department Stores		
Offices		
Industrial Facilities		
Manufacturing Facilities	88%	93%
Storage Properties	82%	86%
Other		
Total All Uses	82%	93%

Again, the operational reliability of automatic sprinkler systems as reported by the non-adjusted data is lower than what was reported in the original paper by this author.

Performance Reliability

Performance reliability is not easily determined using NFPA fire data. Some of the studies cited in Table 1 use the number of sprinklers operating as a means of evaluating performance reliability. In a performance-based design, the ultimate evaluation may be whether the outcome is consistent with the expected performance as documented during the design process.

It is understood that most automatic sprinkler systems are designed to control a fire but not necessarily to completely extinguish the fire. The NFPA fire data supports the concept that sprinkler

systems can control fires but do not necessarily result in complete extinguishment. Table 5 indicates the percentage of fires where sprinklers are present and that are reported as being extinguished by an automatic suppression system. Note that the data includes the fires reported to be extinguished by all types of automatic suppression systems and not only those extinguished by automatic sprinkler systems. However, since automatic extinguishing systems other than sprinkler systems constitute only a tiny fraction of protected areas, it is reasonable to assume that the overall automatic extinguishing system data can be interpreted as a relatively accurate indication of sprinkler system data.

The data in Table 5 has not been updated to include the periods from 1999 through 2002. Instead, the August 2005 report indicates that when sprinkler systems operate they are effective in 96% of the incidents. Assuming the validity of the data entry used to generate this value, the August 2005 report would be a better means to measure performance reliability than the data in Table 5.

Table 5

Property Use	Estimated Number of Fires with Sprinklers Present (1989-1998)	Estimated Number of Fires reported to be Extinguished by an Automatic Suppression System (1989-1998)	Percent of Fires Extinguished by System
Public Assembly	30,000	8,000	26.7%
Educational	11,700	1,000	8.5%
Health Care and Correctional Facilities	41,900	5,000	11.9%
All Residential	87,500	17,000	19.4%
One- and two- family dwellings	16,900	3,000	17.8%
Apartments	50,000	10,000	20.0%
Hotels and Motels	12,900	2,000	15.5%
Department Stores	28,700	6,000	20.9%
Offices	10,700	2,000	18.7%
Industrial Facilities	4,100	1,000	24.4%
Manufacturing Facilities	49,800	13,000	26.1%
Storage Properties	9,000	3,000	33.3%
Total All Uses	273,400	53,000	19.4%

While property loss and life loss are greatly reduced in buildings protected with an automatic sprinkler system, the sprinkler system alone is not providing the entire increased protection.

Summary

While NFPA fire data clearly demonstrates that property loss and life loss are reduced in buildings protected throughout with an automatic sprinkler system, the same data has indicated in the past that sprinklers fail to operate 1 in every 6 fires that are large enough to activate a sprinkler. The nonadjusted data in the more recent studies indicates that the operational reliability of automatic sprinkler systems may be decreasing. However, improvements in the data collection system enable a better evaluation of the data and based upon the August 2005 NFPA report, the operational reliability of sprinkler systems may be as high as 93%.

It has been stated that unreported fires may increase the reliability of automatic sprinkler systems. However, no data has been presented to support that claim. It is common in the U.S. that current building and fire codes require the water flow alarm from an automatic sprinkler system to automatically transmit an alarm to an alarm receiving facility. This should have the effect of increasing

the percentage of fires reported to fire departments in buildings protected with an automatic sprinkler system.

The original paper indicated that the uncertainty in the data could result in an operational reliability of sprinkler systems in the area of 90%. In subsequent presentations regarding the paper, this is the value that the author has used. This is the same value that is proposed to be used for sprinkler system reliability for life safety purposes in a British Standard.[26] The same British standard proposes a value of 80% for automatic sprinkler system reliability when considering property protection.

The NFPA data indicates that the commonly stated reliability of automatic sprinkler systems in the range of 96% (fails once in every 25 fires) is overstating the reliability of sprinkler systems unless there are assurances that the preventive maintenance on the system is substantially better than that on the average system in a building in which a fire has occurred. When combining the operational effectiveness and performance effectiveness data as published in the August 2005 NFPA report, the overall reliability of automatic sprinkler systems is 89%. This value is extremely close to the 90% value previously proposed by this author and the value proposed by the British Standard.

The paper was commissioned by the Alliance for Fire and Smoke Containment and Control, Inc.

William E. Koffel, P.E., is President of Koffel Associates, Inc., a fire protection engineering and code consulting firm with offices in Maryland and Connecticut. Mr. Koffel has a B.S. in Fire Protection Engineering and he has over 26 years of experience as a practicing fire protection engineer. Mr. Koffel participates actively in the model code development processes of the International Code Council and the National Fire Protection Association and has served on numerous committees within each process. He has previous experience with the Maryland State Fire Marshal's Office and has been a volunteer firefighter.

[26] **BSI PD7974-7 (2003) –***Application of fire safety engineering principles to the design of buildings – probabilistic risk assessment*

Appendix D

Ten Largest Private Nonresidential Permitted Construction Projects in California: 2005

Number	Description	City County	Value
1	Pharmaceutical Manufacturing Facility	Vacaville Solano County	$200.0 million
2	Private Museum Building	San Francisco San Francisco County	$130.0 million
3	Office Development	Irvine Orange County	$54.8 million
4	Hotel	Westlake Village Los Angeles County	$52.0 million
5	Private Music School Building	Los Angeles Los Angeles County	$51.5 million
6	Office Development	San Diego San Diego County	$47.7 million
7	Office Development	Irvine Orange County	$47.1 million
8	Office Building	Modesto Stanislaus County	$46.4 million
9	Office Development	Irvine Orange County	$45.2 million
10	Office Development	Irvine Orange County	$45.1 million
		Total*	$719.8 million

*Note: Total for Nonresidential Permitted Construction in California was **$14.389 billion**

Reference: Construction Industry Research Board, 2006. "Building Permit Summary: California Cities and Countries Data for Calendar Year 2005." Burbank, California.

Appendix E

How will the changes to the 2006 **International Building Code** proposed by the California Office of the State Fire Marshal [OSFM] effect R-2 building costs?

With regard to multi-family buildings constructed specifically, while only a portion of R2's would be regulated by the proposed OSFM regulations, a concern exists that local jurisdictions might also adopt and apply those regulations. What then, would be the fiscal impact on projects built according to the proposed OSFM regulations - as compared to current building costs as under the current California Building Code?

To answer this, we have evaluated current allowances for Type V-1 hour buildings for R-2 (R-1 in the 2001 CBC) uses and compared those with the proposed, IBC based CBC with OSFM amendments.

Under the existing CBC, the basic area allowed for Type V-1 hour buildings for R-2 (R-1 in the 2001 CBC) is 10,500 square feet with a basic height allowance of three stories for un-sprinklered buildings. An increase can be made to four stories for such buildings if an appropriate automatic sprinkler system is used. The maximum building area allowed under the existing CBC (utilizing all of the allowable area increases permitted in the code) for this construction type and occupancy is 42,000 square feet and four stories, or 84,000 square feet for a three story building.

If the proposal from the Office of the State fire Marshal is adopted, in the parlance of the IBC code, Type V-A buildings will correspond to the existing Type V- 1 hour fire endurance rated holdings. Following the logic above and allowing for height increase or area increases, the largest possible building under the proposals being discussed will be 96,000 ft.² (for a three-story building), an increase of 12,000 ft.² - approximately a 14% increase in total area over what is currently allowed.

Likewise, under the provisions of the existing CBC vs. the proposed CBC with OSFM amendments, the largest possible 4 Story building of this type allowed under the proposals being considered will be 48,000 ft.², an increase of 6,000 ft.² This will also provide an approximately 14% increase for the new code with proposed amendments in total area over what is currently allowed under the existing CBC .

As such, construction of either these large three or four-story apartment buildings, under the provisions of the 2006 IBC subject to the SFM H&A amendments will end up costing roughly equal or less than the same building built under the existing California Building code on a per square foot basis for the following reasons:

- The proposed new regulations allow for increases in the range of 13-14% in allowable area beyond what is *currently* allowed by the CBC.
- The proposed new regulations will not require any additional fire resistive building construction elements.
- The proposed new regulations will not require any fire safety features not currently required by the California Building Code.
- Dependent on design of included areas, costs per square foot to construct projects under the proposed code will be reduced over those associated with the current California Building Code and economy of scale issues suggest a corresponding reduction in cost per square foot based on the larger permissible areas.